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THE FOSSIL BISON OF KANSAS.

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Read before the Academy, at Topeka, December 30, 1904.

THE heavy floods of the spring of 1903 excavated in the valley of the Kaw river numerous washouts of considerable size and extent. In one of these near North Lawrence several bison crania were exposed. So far as I am aware, these all belong to the common species, *Bison bison*, with the exception of one, which was secured by Mr. C. H. Sternberg, and sold to the University. This specimen differs from the remainder also in being completely fossilized. Unfortunately only a portion of the cranium is preserved, but sufficient remains to indicate the main structural characters, and these are such as to point to the existence of a new species of bison. Since Kansas was the home of the bison in such a large measure, it seems eminently fitting that the name of the two should be associated together, and I have accordingly called the new form *Bison kansensis*.

Bison remains are often found throughout the state, and, in order to make the determination of these possible by those who have not access to the literature, I append a key to the species so far described. It is based upon the work of Allen and of Lucas, and specific characters are given in relation to the horn cores. Doubtless there are valid objections to making one character the basis of specific determinations, but since this portion of the animal is the one with which we have oftenest to deal, necessity and common sense make the classification the most useful and effective. Since there is frequently confusion of the two genera, *Bison* and *Bos*, the generic characters of the former are given:

GENUS **Bison** SMITH. Forehead convex, with vertical and lateral diameters in the ratio of 2:3; horns attached some distance in front of occipital angle; outline of occipital region semicircular and forming an obtuse angle with fore head; intermaxillaries short, triangular, acute behind, and not reaching to the nasals; orbital, lachrymal and malar processes forming a projecting cylinder for the eyes; ribs in fourteen pairs. Limbs slenderer than in *Bos*, and dorsal spines much longer; cannon bones longer in the hind limbs than in fore limbs. Body covered with short, crisp, woolly hair, becoming long and bushy upon the head. The fore legs are fringed with long, coarse hair.

The species of bison may be classified according to the following key, in which the characters of the horn cores are used for differentiation, according to Lucas.

- (A) Horn cores placed at right angles to the longitudinal axis of skull..... *antiquus*.

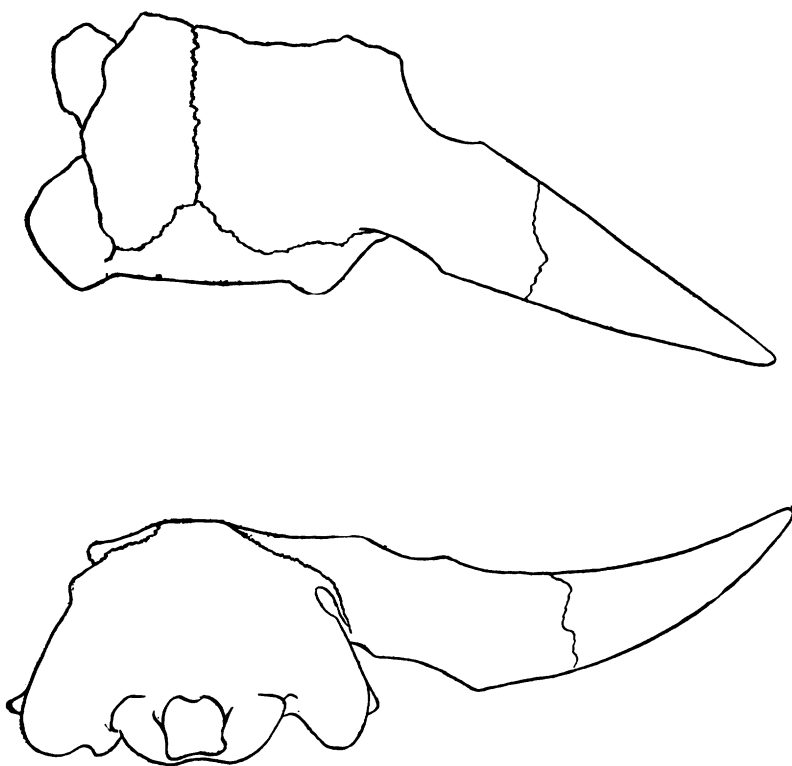


FIG. 10.—Skull of Fossil Bison.

(B) Horn cores placed at an acute, posteriorly directed angle, with longitudinal axis of skull.

(a) Circumference of horn cores at base as great as, or *greater* than, length along upper curve. Transverse and vertical diameters about the same.

1. Horn cores short, recurved, not anywhere arising much above occipital crest *bison*.
2. Horn cores moderate, strongly and regularly curved upward and backward..... *occidentalis*.
3. Horn cores moderate, curve regular and moderate, raking strongly backward *kansensis*.

(b) Circumference of horn cores at base *much less* than length along upper curve. Transverse diameter much exceeding the vertical.

1. Horn cores moderately curved, stout, strongly elliptical in cross section..... *crassicornis*.
2. Horn cores strongly curved, elliptical in cross section, moderately stout..... *alleni*.

(c) Circumference of horn cores at base *much less* than length upon upper curve. Transverse diameter slightly exceeding the vertical. Curve regular but slight.

1. Size medium, flattened above..... *ferox*.
2. Size large, subcircular in section..... *latifrons*.

The measurements include only the portion of the core covered by horn in the living condition. Transverse diameter is measured parallel to the longitudinal axis of skull; vertical diameter at right angles to this.

It must of course be remembered that there is no little individual variation in the form and structure of the horn cores, and also that these organs differ in the two sexes. These facts introduce real faults in the scheme of classification proposed above, but they appear to be unavoidable. It is a fair question whether any one character offers a more reliable diagnostic value. At any rate, we have to make the best use of available data, and it is unnecessary to point out that due caution should be employed in this particular case. In *Bison bison*, the form with which we are most familiar, there are marked sexual differences, the horn cores of the bull being much heavier and, as a rule, less curved than in the cow. Probably similar conditions prevail among the other species in some measure. It would appear that the specimens upon which species have been founded are generally males, and this fact must be borne in mind.

The above key contains all the known species of bison found in North America. Of these, there have been found in Kansas the following: *B. bison*, *B. occidentalis*, *B. alleni*, *B. latifrons*, *B. kansensis*. The type specimen of *B. alleni* was obtained at the Blue river, of this state, and probably the best specimen of *B. occidentalis* so far secured was obtained from Gove county, and is now in the

museum of the University of Kansas. An exceptionally fine pair of horns of *B. latifrons* was unearthed in Sheridan county. This specimen measures some eight feet from tip to tip of the horn cores.

A brief description of the new species will be sufficient. As will be seen from figure 10, the horn core descends rapidly from the level of the forehead and barely attains it again at the upcurved tip. Viewed from above, the core is observed to rake strongly and persistently backward, so that it has passed the level of the occipital region a short distance out from the line indicating the limit of the horn attachment. In section the core is subcircular in outline, and the circumference at the base exceeds the estimated length along the upper curve. The specimen thus falls within the group containing *B. bison* and *B. occidentalis*. It may be distinguished from *B. bison* by the greater size of the horns and by their rapid backward extension beyond the line of the occipital crest. It is separated from *B. occidentalis* by the strong downward sweep of the horns. A comparison of the measurements of the horn cores from specimens of the three species of this group is shown in the following table:

	B. bison. mm.	B. occident. mm.	B. kansensis. mm.
Vertical diameter	76	108	90
Transverse diameter.....	81	108	97
Circumference at base.....	253	343	290
Length along upper curve.....	180	318	250 (est.)
Length along lower curve.....	235	372	265 (est.)
Distance between tips.....	650	875	840 (est.)

These measurements are taken from specimens in the museum of the University of Kansas.